

## SECTION II

### EXCAVATION AND BACKFILL FOR UTILITY SYSTEMS

#### 2.01 Scope

The work included under this section consists of clearing, excavating, grading and backfilling required for the construction of all sewer lines, force mains and other utility lines as shown on the drawings and specified herein.

#### 2.02 Clearing

The Contractor shall perform all clearing necessary, within the working limits of the trenches, for the proper installation of all utility lines in the locations shown on the drawings. Plantings, shrubbery, trees, utility poles or structures subject to damage resulting from the excavation shall be transplanted, relocated, braced, shored or otherwise protected and preserved unless otherwise directed by the Engineer.

#### 2.03 Excavation

##### A. General

The Contractor shall perform all excavation of every description and of whatever substances encountered, to the dimensions and depth shown on the drawings, or as directed. All excavated materials not required for fill or backfill shall be removed or wasted as directed. All excavations shall be made by open cut. Trenches shall be kept as nearly vertical as possible and, if required to protect the safety of workmen, the general public, this or other work or structures, or to maintain trench widths within the limits hereinafter specified, shall be properly sheeted and braced. Where, in the opinion of the Engineer, damage is liable to result from withdrawing sheeting, the sheeting shall be left in place, and in no event shall sheeting be removed below the top of the installed pipe without specific permission of the Engineer. Any sheeting left in place shall be cut off two feet below grade. All existing utilities, such as pipes, poles and structures shall be carefully supported and protected from injury, and in case of damage, they shall be restored at no cost to the Owner.

The width of pipe trenches below the top of the proposed pipe shall be maintained so as to provide a clearance on each side of the pipe barrel not less than eight inches (8"). The bottom of trenches shall be shaped to give substantial uniform circumferential support for the lower one third (1/3) of the pipe barrel. Bell holes shall be excavated accurately to size by hand so that the bell of the pipe is not resting on the

trench bottom. Any excess excavation below the required levels for proper pipe installation shall be backfilled with drainfield limerock up to the level of the lower one third (1/3) of the proposed pipe barrel and shall be tamped and compacted to provide proper support for the proposed pipe, at no cost to the Owner.

Where rock or other similar, hard, cemented, granular material is encountered in the bottom of pipe trenches, excavation shall be carried to a level eight inches (8") below the outside bottom of the proposed pipe barrel. The resulting excavation shall be backfilled with drainfield limerock up to the level of the lower one third (1/3) of the proposed pipe barrel. This backfill shall be tamped and compacted to provide a proper bedding for the pipe and shall then be shaped to receive the pipe as outlined in "Laying Pipe", Section III.

No additional payment shall be made for this work and the costs incurred shall be included in quoted unit price in the Proposal for other applicable items of work.

Excavation for manholes and other appurtenances shall be sufficient to leave at least twelve inches (12") in the clear between their outer surfaces and the embankment or timber that may be used to protect them. Backfill of earth under manholes will not be permitted and any excess excavations for these structures shall be filled with 2500 psi concrete, or as specified below under Alternate Methods of Construction, at no additional cost to the Owner.

Materials removed from the trenches shall be stored and disposed of in such a manner that they will not interfere unduly with traffic on public streets and sidewalks and they shall not be placed on private property. In congested areas, such materials as cannot be stored adjacent to the trench or used immediately as backfill shall be removed to convenient places of storage. Excess materials and material unsuitable for backfill shall remain the property of the Owner and shall be removed and disposed of as directed by the Engineer, at the Contractor's expense, immediately after backfill has been placed.

#### B. Removal of Water

It is a basic requirement of these specifications that excavation shall be free from water before pipe or structures are installed.

The Contractor shall provide all necessary pumps, underdrains, well point systems and other means for removing water from trenches and other parts of the work. The Contractor shall continue dewatering operations until the backfill has progressed to a sufficient depth over the pipe to prevent floatation or movement of

the pipe in the trench.

Water from the trenches and excavation shall be disposed of in such a manner as will not cause injury to public health, to public or private property, to the work completed or in progress, to the surface of the streets, or cause any interference with the use of the same by the public.

C. Alternate Methods of Construction

Should porous sub-strata and a relatively high ground water table be found to exist at the site of the proposed work, it is recognized that it may be very difficult and costly to dewater excavations. In view of this the foregoing requirements for dewatering may be waived if the Contractor, at his option, chooses to employ the following alternate methods of construction in accordance with the provisions outlined. Prior to his selection of one of the alternate methods of construction, the Contractor shall obtain the concurrence of the Engineer that the method selected is applicable to the conditions existing in the particular area.

1. Rock Areas

In areas where well formed stratified limerock is encountered, resulting in well defined vertical trench walls and hard, unyielding trench bottoms, and where dewatering is extremely difficult due to the high porosity of the rock, the Contractor may, at his option, employ the following alternate method of construction in lieu of dewatering.

Under these conditions, the trenches shall be undercut and backfilled to receive the pipe as specified for rock bottomed trenches under Section 2.03-A, above. The work may then be installed under water.

11. Rock-Sand or Sandy Areas

In areas where, due to layers of porous rock existing above or below the proposed pipe location, such that dewatering is extremely difficult, the Contractor, at his option, may employ the following alternate method of construction in lieu of dewatering.

Trenches shall be sheeted, if required to maintain trench widths within the limits specified, or in accordance with Section 2.03-A, above. Excavation shall be carried to a minimum of eight inches (8") below the outside bottom of the proposed pipe barrel, where rock

may be encountered in trench bottoms, or a minimum of two feet (2.0') in areas where material in trench bottoms is other than firm stratified limerock. The resulting excavation shall be backfilled to receive the pipe as specified for rock bottomed trenches under Section 2.03-A, above. The work may then be installed under water. After the pipe is installed, the trench shall be backfilled with drainfield limerock to a level of one foot (1.0') above the top of the proposed pipe barrel.

If approved interlocking steel sheeting is used, it may be removed providing removal is done in such a manner so as not to disturb the bedding or alignment of the installed pipe.

#### D. General Conditions

The methods of alternate construction set forth above will be accepted, in lieu of the general requirements set forth in Item B, above, should the Contractor, at his own option, elect to employ these alternate methods. No additional payment will be made the Contractor for excavation, backfill, sheeting or any costs incurred for work or materials, or any other costs incurred, as a result of alternate methods of construction selected by the Contractor, but the prices established in the quotation form shall be full payment for the various items of work to be done.

The alternate methods of construction, if selected by the Contractor, shall in no way be construed as relieving the Contractor of his basic responsibility for satisfactory completion of the work in accordance with these specifications.

#### 2.04 Additional Excavation

Where organic materials such as roots, muck or other vegetable matter is encountered in pipe trenches, below the level of the top of the proposed pipe, which, in the opinion of the Engineer, will result in unsatisfactory foundation conditions, it shall be removed and wasted. Sheetting shall be installed if necessary to maintain pipe trenches within the limits specified. The resulting excavation shall be backfilled with drainfield limerock as specified above.

Where such additional excavation is deemed necessary by the Engineer, payment will be made for such additional work as described under Basis of Payment at the unit price quoted in the Proposal.

## 2.05 Trench Stabilization

No claims for extras, or additional payment, will be considered for cost incurred in the stabilization of trench bottoms which are rendered soft or unstable as a result of construction methods, such as improper or inadequate sheeting, dewatering or other causes. In no event shall pipe be installed when such conditions exist and the Contractor shall correct such conditions so as to provide proper bedding or foundations for the proposed installation at no additional cost to the Owner.

## 2.06 Backfill

Backfilling of utility trenches will not be allowed until the work has been inspected by the Engineer and he indicates that backfilling may proceed. Any work which is covered up or concealed, without the knowledge and consent of the Engineer, may be required to be uncovered or exposed at no cost to the Owner.

Backfill material shall be free of all debris, lumps, clods, broken paving or any organic or unstable material. Backfill material placed within one foot (1.0') of utility lines shall not contain any stones or rocks larger than two inches (2") in diameter and no stones or rocks larger than six inches (6") in diameter will be permitted in any backfill.

Backfill shall be carefully placed and tamped around and over the pipe, in not more than six inch (6") layers to a depth of one foot (1.0') over the pipe. Backfill over the pipe shall be placed in six inch (6") layers and compacted by mechanical vibrators to a minimum depth of two and one-half feet (2.5') over the pipe. The remaining backfill shall be placed and compacted so as to insure 90% density in accordance with ASTM Designation D 698 as modified.

If any of the above provisions for backfill of utility trenches are not applicable, due to alternate methods of construction selected by the Contractor, it shall be the Contractor's responsibility to perform this work in such a manner so that, in the opinion of the Engineer, the final work will meet the standards specified.

The Contractor shall be responsible for filling to the level of the adjoining ground any depressions caused by shrinkage or settlement of the backfill.

## 2.07 Barricades and Protection of Work

The Contractor shall protect his work throughout its length by the erection of suitable barricades and hand railings where required. He shall further indicate this work at night

by the maintenance of suitable lights or flares, especially along or across thoroughfares. Wherever it is necessary to cross a public walk, he shall provide a suitable safe walkway with hand railings. All utility access manholes, valves, fire hydrants and letter boxes shall be kept accessible for use at all times. He shall also comply with all laws and ordinances covering the protection of such work and the safety measures to be employed therein.

#### 2.08 Existing Utility Lines

Attention is again called to the fact that the Contractor shall cooperate with the local utility owners and assist in their location and protection. He shall keep the utility owner notified of his proposed construction program, in order that they may locate, and where necessary, remove and replace such utility which conflicts with his construction. The Contractor, in cooperation with the utility owners, shall determine the utility lines extent and exact location.

#### 2.09 Clean-Up

Upon completion of the work, the area shall be cleared of all trash and excess material and the area raked clean. Grass plots shall be restored to the condition existing prior to making the excavation.

#### 2.10 Payment

No separate payment will be made for any item of work specified in this section of these specifications, except for Additional Excavation, as specifically stated in Section 2.04, and the prices established in the Quotation Form shall include all costs and expenses incurred herein.